

Occultations observed at Beloit, Wisconsin, in 1884-85.
By J. Tatlock.

(Communicated by the Secretaries.)

From August 1884 to July 1885 I was in charge of a small Observatory at Beloit, Wisconsin, and during that time the observation of occultations of stars by the Moon was made a prominent feature of the Observatory work. Such observations of this nature as I succeeded in making are given in what follows. The list is comparatively small, but much of my time was occupied with other matters and duties, and the weather during the winter of 1884-85 and the spring of 1885 was particularly unfavourable for astronomical work in this locality.

The position of the Observatory is assumed to be—

Long. $5^{\text{h}} 56^{\text{m}} 7^{\text{s}}.30$ West of Greenwich,
Lat. $+42^{\circ} 30' 9''$.

These coordinates were determined by triangulation from points in the immediate vicinity of the Observatory which had been fixed by the State Survey of Wisconsin, whose positions depend upon the Coast Survey (telegraphic) longitude and latitude of Madison. This position is undoubtedly susceptible of correction, but I think it is abundantly accurate for the reduction of the observations contained in this paper.

The occultations were observed with an Equatorial having a Clark objective of 9.5 English inches in diameter. A power of 220 was usually employed, though some of the observations were made with a power of 100. A part of the occultations were observed by the eye-and-ear method, using a sidereal chronometer, but the majority were registered on the chronograph, with a Howard mean-time clock graduating the sheet.

I made a great effort to have the time determination as accurate as possible. The Transit was an instrument of antique construction, with an objective of 2.5 inches in diameter, and fitted with a diagonal eyepiece with a power of about 35. The instrument was rather unsteady in level and azimuth, and I consequently determined the inclination of the axis at frequent intervals, at least once for every star. The collimation was determined from the star observation, and as this demanded a reversal of the instrument, I always assumed, in the reduction, two values of the azimuth constant. The time determinations were made by the eye-and-ear method, using a sidereal chronometer, and the time was found on every night on which occulta-

tions were observed. I find that the probable error of a clock correction from a single star is $\pm 0^s.095$; and as four time stars were always observed, if possible, the probable error of an adopted clock correction is about $\pm 0^s.05$. Considering the character of the instrument, this is as good a result as could be expected. The rates of the chronometer and clock were checked by frequent comparison.

I have given in the accompanying table both the Beloit and the Greenwich time of the observations, the longitudes mentioned above having been used in the conversion. The last column of the table denotes the method according to which the observation was made, E denoting the eye-and-ear, and C the chronographic. There is a little uncertainty concerning the identity of a few of the small stars, as the facilities for identification at my disposal were extremely limited.

I have also given the places of the Moon, both geocentric and apparent, computed for the Greenwich times of the occultations. The geocentric places were taken from the *American Ephemeris and Nautical Almanac*, and the apparent places were computed by the formulæ given in Chauvenet's Astronomy.

I have not given the places of the stars, because I have not the necessary catalogues at hand.

No.	Date.	Star.	Phase.	Limb.	Beloit M. T.			Greenwich M. T.			
	1884.										
1	Aug. 31	ρ' Sagittarii	Immersion	Dark	10	44	7.9	16	40	15.2	E
2	Sept. 10	D. M. + 16° 591	,,	Bright	12	45	48.3	18	41	55.6	E
3	10	D. M. + 16° 602	,,	,,	13	45	13.0	19	41	20.3	E
4	11	115 Tauri	,,	,,	13	55	42.4	15	3	0.2	E
5	11	115 Tauri	Emersion	Dark	19	51	49.7	29	59	7.5	E
6	Sept. 24	χ Ophiuchi	Immersion	,,	7	39	57.9	13	36	5.2	E
7	Oct. 10	λ Geminorum	,,	Bright	17	14	46.0	23	10	53.3	E
8	Nov. 8	A ² Cancri	,,	,,	12	34	39.4	18	30	46.7	E
9	8	D. M. + 13° 1995	,,	,,	12	36	58.4	18	33	5.7	E
10	8	A ² Cancri	Emersion	Dark	13	40	8.2	19	36	15.5	E
11	Nov. 8	α Cancri	Immersion	Bright	18	21	38.7	24	17	46.0	E
	1885.										
12	Jan. 25	63 Tauri	,,	Dark	13	14	22.2	14	4	56.5	C
13	25	63 Tauri	Emersion	Bright	19	10	29.5	20	1	3.8	C
14	Jan. 28	λ Geminorum	Immersion	Dark	6	43	6.1	12	39	13.4	C
15	Feb. 20	LL. 5725	,,	,,	11	15	4.4	17	11	11.7	C
16	22	B. A. C. 1526	,,	,,	9	2	0.2	14	58	7.5	C
17	Feb. 22	B. A. C. 1526	Emersion	Bright	9	49	32.9	15	45	40.2	C
18	Mar. 19	38 Arietis	,,	,,	8	21	35.4	14	17	42.7	C
19	19	D. M. + 11° 385	Immersion	Dark	8	23	33.3	14	19	40.6	C

No.	Date.	Star.	Phase.	Limb.	Beloit M. T.			Greenwich M. T.		
					h	m	s	h	m	s
20	^{1885.} Mar. 19	D. M. + 11° 387	Immersion	Dark	8	32	27.6	14	28	34.9 (
21	19	D. M. + 11° 386	"	"	8	33	55.5	14	30	2.8 (
22	21	D. M. + 16° 641	"	"	8	41	15.2	14	37	22.5 I
23	22	D. M. + 17° 979	"	"	8	16	14.1	14	12	21.4 (
24	22	Anon.	"	"	8	37	40.9	14	33	48.2 I
25	22	130 Tauri	"	"	10	59	29.9	16	55	37.2 (
26	22	D. M. + 17° 1006	"	"	11	5	39.2	17	1	46.5 (
27	22	D. M. + 17° 1011	"	"	11	16	39.8	17	12	47.1 (
28	22	130 Tauri	Emersion	Bright	11	48	18.5	17	44	25.8 (
29	23	D. M. + 17° 1336	Immersion	Dark	7	12	24.4	13	8	31.7 (
30	23	D. M. + 17° 1341	"	"	7	14	57.4	13	11	4.7 (
31	23	D. M. + 17° 1344	"	"	7	20	14.8	13	16	22.1 (
32	23	Anon.	"	"	7	21	56.0	13	18	3.3 C
33	Mar. 24	D. M. + 16° 1546	"	"	9	26	28.2	15	22	35.5 (
34	Apr. 20	D. M. + 16° 1493	"	"	10	1	38.4	15	57	45.7 (
35	May 21	<i>d</i> Leonis	"	"	10	57	6.7	16	53	14.0 C
36	June 16	D. M. + 9° 2338	"	"	8	50	44.2	14	46	51.5 (
37	16	D. M. + 9° 2341	"	"	9	27	6.9	15	23	14.2 C
38	16	Anon.	"	"	9	29	36.9	15	25	44.2 C
39	June 18	D. M. + 1° 2585	"	"	9	16	25.1	15	12	32.4 C

March 1886.

observed at Beloit, Wisconsin.

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No.	Date. 1884.	α °	δ °	π "	S "	$\Delta\alpha$ "	α' "	$\Delta\delta$ "	δ °	S "
1	Aug. 31	289 0 22'22	-17 4 48'79	55 6'40	900'20	-23 17'21	288 37 5'01	-45 42'97	-17 50 31'76	905'85
2	Sept. 10	63 36 32'44	+17 7 5'10	59 21'13	969'62	+40 32'44	64 17 4'88	-32 19'43	+16 34 45'67	978'55
3	10	64 13 5'84	+17 11 14'84	59 21'03	969'59	+33 56'33	64 47 2'17	-29 41'98	+16 41 32'86	980'99
4	11	79 10 47'49	+18 17 37'19	59 15'08	968'02	+39 34'42	79 50 21'91	-31 0'83	+17 46 36'36	977'65
5	11	79 52 34'07	+18 19 0'76	59 14'72	967'92	+31 21'16	80 23 55'23	-28 2'12	+17 50 58'64	980'17
6	Sept. 24	245 30 28'53	-17 17 13'51	54 13'55	885'88	-34 2'09	244 56 26'44	-41 55'38	-17 59 8'89	888'82
7	Oct. 10	107 28 24'94	+17 9 28'31	58 56'56	962'99	+6 41'52	107 35 6'46	-25 32'65	+16 43 55'66	977'99
8	Nov. 8	129 35 58'19	+13 35 38'38	58 38'22	958'00	+42 33'18	130 18 31'37	-35 27'80	+13 0 10'58	964'11
9	8	129 37 18'70	+13 35 20'92	58 38'12	957'97	+42 25'21	130 19 43'91	-35 22'39	+12 59 58'53	964'21
10	8	130 13 51'48	+13 27 23'00	58 36'07	957'42	+37 17'23	130 51 8'71	-33 4'56	+12 54 18'44	966'46
11	Nov. 8	132 55 43'54	+12 50 57'11	58 26'92	954'94	-8 58'85	132 46 44'69	-29 19'54	+12 21 37'57	968'48
12	1885. Jan. 25	64 42 53'46	+16 59 12'28	59 51'14	977'78	-45 33'57	63 57 19'89	-36 25'85	+16 22 46'43	983'20
13	25	65 14 30'44	+17 2 59'22	59 52'30	978'09	-46 11'95	64 28 18'49	-39 4'42	+16 23 54'80	980'05
14	Jan. 28	107 1 11'50	+17 29 33'45	60 46'78	993'00	+40 6'65	107 41 18'15	-32 10'06	+16 57 23'39	1003'13
15	Feb. 20	45 33 14'64	+13 34 11'14	58 28'58	955'30	-44 13'87	44 49 0'77	-39 7'36	+12 55 3'78	956'82
16	22	72 56 36'98	+17 37 48'51	59 16'10	968'23	-27 6'29	72 29 30'69	-27 36'06	+17 10 12'45	981'30
17	Feb. 22	73 25 57'60	+17 40 8'29	59 16'78	968'42	-33 59'32	72 51 58'28	-29 19'21	+17 10 49'08	979'87
18	Mar. 19	40 36 0'09	+12 23 35'67	58 40'64	958'60	-44 3'42	39 51 56'67	-37 31'45	+11 46 4'22	962'37
A 19	19	40 37 8'28	+12 23 51'56	58 40'68	958'61	-44 5'98	39 53 2'30	-37 35'79	+11 46 15'77	962'28
20	19	40 42 17'46	+12 25 3'55	58 40'81	958'65	-44 21'35	39 57 56'11	-37 55'60	+11 47 7'95	961'88
21	19	40 43 8'37	+12 25 15'34	58 40'83	958'65	-44 16'38	39 58 51'99	-37 58'74	+11 47 17'60	961'81

No.	Date. 1884.	α	δ	π	S	$\Delta\alpha$	α'	$\Delta\delta$	δ'	S
22	Mar. 21	69 26 43.14	+17 14 24.53	59 8.04	966.05	-50 28.98	68 36 14.16	-31 59.51	+16 42 25.02	975.07
23	22	83 59 43.78	+18 7 57.56	59 13.83	967.70	-30 22.53	83 29 21.25	-27 55.39	+17 40 21.17	980.14
24	22	84 13 1.72	+18 8 16.21	59 13.89	967.72	-33 23.29	83 39 38.43	-28 45.45	+17 39 30.76	979.41
25	22	85 40 59.92	+18 9 56.55	59 14.24	967.82	-45 26.26	84 55 33.66	-35 45.56	+17 34 10.99	973.24
26	22	85 44 48.98	+18 9 59.89	59 14.25	967.82	-45 36.96	84 59 12.02	-36 5.88	+17 33 54.01	972.06
27	22	85 51 38.85	+18 10 5.87	59 14.26	967.81	-45 51.23	85 5 47.62	-36 42.37	+17 33 23.50	972.38
28	22	86 11 17.02	+18 10 21.65	59 14.36	967.83	-45 59.30	85 25 17.72	-38 27.73	+17 31 53.92	970.17
29	23	98 13 26.60	+17 56 58.66	59 15.18	968.00	-9 20.07	98 4 6.53	-25 3.67	+17 31 54.99	983.16
30	23	98 15 1.32	+17 56 53.96	59 15.17	968.00	-9 49.32	98 5 12.00	-25 5.05	+17 31 48.91	982.13
31	23	98 18 17.85	+17 56 44.15	59 15.17	968.00	-10 49.76	98 7 28.09	-25 10.07	+17 31 34.08	983.06
32	23	98 19 20.54	+17 56 41.02	59 15.17	968.00	-11 8.97	98 8 11.57	-25 11.50	+17 31 29.52	983.04
33	Mar. 24	114 20 41.54	+16 29 15.46	59 11.52	966.99	-23 4.37	113 57 37.17	-27 48.20	+16 1 29.26	980.49
34	Apr. 20	111 25 43.80	+16 54 38.60	59 20.97	969.65	-42 47.06	110 42 56.74	-33 48.16	+16 20 50.44	976.65
35	May 21	164 2 9.32	+4 56 34.62	59 49.07	944.59	-37 25.37	163 24 43.95	-37 10.02	+4 19 24.60	951.23
36	June 16	145 45 17.32	+10 34 58.70	59 37.18	974.00	-42 52.45	145 2 24.87	-37 12.99	+9 57 45.71	979.68
37	16	146 6 36.86	+10 29 16.87	59 35.99	973.68	-44 18.83	145 22 18.03	-38 22.01	+9 50 54.86	977.49
38	16	146 8 4.72	+10 28 53.33	59 35.91	973.66	-44 22.51	145 23 42.21	-38 26.20	+9 50 27.13	977.34
39	18	172 48 35.31	+2 21 1.63	57 54.65	946.06	-34 47.45	172 13 47.86	-38 9.29	+1 42 52.34	953.39

Hoosac Falls, N.Y., U.S.A.: 1885, January 14.

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Erratum in Annual Report, 1886.

Page 207, line 19 from bottom, *for* deviation *read* direction.

* * The Council are indebted to the Editor of *Nature* for permission to insert the obituary notice of Sir F. J. O. Evans, published in the Annual Report.